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From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

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NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT

(PCT Rule 71.1)

Date of mailing
(day/month/year)

02.11.2004

Applicant's or agent's file reference
702718 PCT

IMPORTANT NOTIFICATION

International application No.
PCT/CA 03/01168

International filing date (day/month/year)
25.07.2003

Priority date (day/month/year)
26.07.2002

Applicant
LITENS AUTOMOTIVE et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

The applicant's attention is drawn to Article 33(5), which provides that the criteria of novelty, inventive step and industrial applicability described in Article 33(2) to (4) merely serve the purposes of international preliminary examination and that "any Contracting State may apply additional or different criteria for the purposes of deciding whether, in that State, the claimed inventions is patentable or not" (see also Article 27(5)). Such additional criteria may relate, for example, to exemptions from patentability, requirements for enabling disclosure, clarity and support for the claims.

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preliminary examining authority:



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INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 702718 PCT	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/CA 03/01168	International filing date (day/month/year) 25.07.2003	Priority date (day/month/year) 26.07.2002
International Patent Classification (IPC) or both national classification and IPC F16D41/20		
Applicant LITENS AUTOMOTIVE et al.		


- This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
- This REPORT consists of a total of 6 sheets, including this cover sheet.

☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

 These annexes consist of a total of 7 sheets.

- This report contains indications relating to the following items:

- I ☒ Basis of the opinion
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or Industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 26.02.2004	Date of completion of this report 02.11.2004
Name and mailing address of the international preliminary examining authority:  European Patent Office - P.B. 5818 Patentlaan 2 NL-2280 HV Rijswijk - Pays Bas Tel. +31 70 340 - 2040 Tx: 31 651 epo nl Fax: +31 70 340 - 3016	Authorized Officer J. Giráldez Sánchez Telephone No. +31 70 340-3488



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/CA 03/01168

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, Pages

1-9 as originally filed

Claims, Numbers

1-29 filed with telefax on 06.10.2004

Drawings, Sheets

1/8-8/8 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
☐ the language of publication of the international application (under Rule 48.3(b)).
☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
☐ filed together with the international application in computer readable form.
☐ furnished subsequently to this Authority in written form.
☐ furnished subsequently to this Authority in computer readable form.
☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
☐ the claims, Nos.:
☐ the drawings, sheets:

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5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)).

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims	1-29
	No: Claims	
Inventive step (IS)	Yes: Claims	20-29
	No: Claims	1-19
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations

see separate sheet

Re Item V

Reasoned statement with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Reference is made to the following documents:

- D1: US-A-6 083 130 (MEVISSSEN PIERRE A ET AL) 4 July 2000 (2000-07-04)
- D2: WO 01/92746 A (BABCOCK BRYCE ;FRAYER ROBERT (US); MILLER JOHN (US); KING RANDALL) 6 December 2001 (2001-12-06)
- D3: US-A-5 437 205 (TSENG SHENG-TSAI) 1 August 1995 (1995-08-01)

2. The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 does not involve an inventive step in the sense of Article 33(3) PCT.

The subject-matter of claim 1 therefore differs from this known decoupler assembly in that: the clutch spring is formed from an uncoated spring steel material.

The problem to be solved by the present invention may therefore be regarded as: improve the torque transmission.

The solution proposed in claim 1 of the present application cannot be considered as involving an inventive step (Article 33(3) PCT) for the following reasons.

Document D2 describes a similar clutch spring (28) where no coating is mentioned. Moreover, the facts that said clutch spring is lubricated (page 5, lines 13-16, lines 31-34), that is manufactured by conventional methods where no further treatments are indicated (page 6, lines 10-13) and that the corresponding figures do not show any representation of such a coating clearly confirm that said clutch spring is not intended to be coated.

This feature is merely one of several straightforward possibilities from which the skilled person would select, in accordance with circumstances, without the exercise of inventive skill, in order to solve the problem posed.

Since documents D1 and D2 are concerned with similar decoupler assemblies, it would be obvious for the skilled person to combine this feature for the same purpose.

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EXAMINATION REPORT - SEPARATE SHEET**

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3. Dependent claims 2-19 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step, see documents D1, D2 and the corresponding passages cited in the search report.

4. The document D1 is regarded as being the closest prior art to the subject-matter of claim 20, and shows (the references in parentheses applying to this document):

A decoupler assembly (600) for transferring torque between an engine driven crankshaft shaft (610) and a drive belt (20), said decoupler assembly comprising:

a hub (609) configured to be fixedly assembled to the crankshaft (610);
a spring support (612) fixedly secured to said hub (609),
a carrier (634) rotatably mounted on said hub (609),
a torsion spring (622) extending between a hub end and a carrier end for transferring torque between said spring support (612) and carrier (634),
a pulley (606) rotatably coupled to said hub (609), said pulley (606) having an outer periphery (607) configured to frictionally engage with the drive belt (20), said pulley (606) having an inner surface (660) formed therein;
a clutch spring (652) fixedly secured to said carrier (634) and having a plurality of helical coils frictionally engaging with said inner surface (660) of said pulley (606) to selectively couple said hub (609) and pulley (606), said torsion spring (622) and said clutch spring (652) wound in opposite senses enabling said clutch spring (652) to expand into gripping engagement with said inner surface (660) during acceleration of said hub (609) relative to said pulley (606) and to contract out of gripping engagement with said inner surface (660) during deceleration of said hub (609) relative to said pulley (606).

The subject-matter of claim 20 differs from this known decoupler assembly in that:

said spring support has a first tab extending outwardly therefrom;
said carrier has a second tab extending outwardly therefrom;
wherein said hub end includes a first notch engaged with said first tab to prevent relative rotation between said hub end of said torsion spring and said spring support, and said carrier end includes a second notch engaged with said second tab to prevent relative rotation between said carrier end of said torsion spring and said carrier.

The subject-matter of claim 20 is therefore new (Article 33(2) PCT).

**INTERNATIONAL PRELIMINARY
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The problem to be solved by the present invention may be regarded as improving the fixation of the torsion spring on both sides.

The solution to this problem proposed in claim 20 of the present application is considered as involving an inventive step (Article 33(3) PCT) for the following reasons:

The documents cited in the Search Report do not give any suggestion to the skilled person to modify the connection of the torsion spring in a decoupler assembly in the manner specified in claim 20.

4.1. Claims 21-29 are dependent on claim 20 and as such also meet the requirements of the PCT with respect to novelty and inventive step.

What is claimed is:

1. A decoupler assembly for transferring torque between a shaft and a drive belt, said decoupler assembly comprising:

a hub configured to be fixedly assembled to the shaft, said hub including a helical first slot formed therein;

a carrier rotatably mounted on said hub, said carrier including a helical second slot formed therein;

a torsion spring extending between a hub end and a carrier end for transferring torque between said hub and carrier, wherein said hub end is retained in said helical first slot to prevent relative movement between said hub end of said torsion spring and said hub and said carrier end is retained in said helical second slot to prevent relative movement between said carrier end of said torsion spring and said carrier;

a pulley rotatably coupled to said hub, said pulley having an outer periphery configured to frictionally engage with the drive belt, said pulley having an inner surface formed therein;

a clutch spring formed from an uncoated spring steel material fixedly secured to said carrier and having a plurality of helical coils frictionally engaging with said inner surface of said pulley to selectively couple said hub and pulley, said torsion spring and said clutch spring wound in opposite senses enabling said clutch spring to expand into gripping engagement with said inner surface during acceleration of said pulley relative to said hub and to contract out of gripping engagement with said inner surface during deceleration of said pulley relative to said hub.

2. A decoupler assembly as set forth in claim 1 wherein said hub includes a body extending axially between first and second ends.
3. A decoupler assembly as set forth in claim 2 wherein said hub includes a cylindrical outer surface extending between said first and second ends.
4. A decoupler assembly as set forth in claim 3 wherein said hub includes a first flange extending radially outwardly from said body to define an outer flange surface having a larger diameter than said body.
5. A decoupler assembly as set forth in claim 4 wherein said first flange includes an annular surface extending radially between said body and said outer flange surface.
6. A decoupler assembly as set forth in claim 5 wherein said helical first slot is formed in said annular surface for retaining therein said hub end of said torsion spring for preventing relative movement between said hub end of said torsion spring and said hub.
7. A decoupler assembly as set forth in claim 6 wherein said hub includes a reduced diameter portion having an outer mounting surface having a smaller diameter than said body of said hub.
8. A decoupler assembly as set forth in claim 7 wherein said hub includes an abutment surface extending radially between said body and said outer mounting surface.

9. A decoupler assembly as set forth in claim 8 wherein said carrier is ring shaped and extends axially between opposite first and second sides.
10. A decoupler assembly as set forth in claim 9 wherein said helical second slot is formed in one of said first and second sides of said carrier for retaining therein said carrier end of said torsion spring for preventing relative movement between said carrier end of said torsion spring and said carrier.
11. A decoupler assembly as set forth in claim 10 wherein clutch spring extends between a hooked proximal end and an opposite distal end.
12. A decoupler assembly as set forth in claim 11 wherein at least one of said first and second ends of said carrier includes a hooked slot for retaining therein said hooked proximal end of said clutch spring to prevent relative movement between said hooked proximal end of said clutch spring and said carrier.
13. A decoupler assembly as set forth in claim 12 wherein said clutch spring includes a non-circular cross-section to improve frictional engagement between said plurality of coils and said inner surface of said pulley.
14. A decoupler assembly as set forth in claim 13 including a bearing member operatively assembled between said pulley and said hub for rotatably mounting said pulley on said hub.

15 A decoupler assembly as set forth in claim 14 wherein said decoupler assembly includes a first lubricant operatively associated with said bearing member for minimizing frictional wear therein and a second lubricant disposed between said clutch spring and said inner surface of the pulley for minimizing wear therebetween, said second lubricant being compatible with said first lubricant such that said the decoupler continues to function if said first lubricant is displaced from said bearing member and mixes with said second lubricant between said clutch spring and said inner surface.

16. A decoupler assembly as set forth in claim 15 wherein said bearing member includes a ball bearing assembly having an inner race engaging said hub and an outer race engaging said pulley.

17. A decoupler assembly as set forth in claim 16 including a thrust washer seated on said outer mounting surface of said reduced diameter portion for axially compressing said torsion spring between said carrier and said hub.

18. A decoupler assembly as set forth in claim 17 wherein said inner race of said ball bearing assembly is press fit onto said outer mounting surface of said reduced diameter portion to retain said thrust washer against said abutment surface, whereby said axial compression of said torsion spring is maintained.

19. A decoupler assembly as set forth in claim 18 wherein said carrier includes a split to allow said carrier to flex and accommodate loads associated with rotation of said decoupler assembly.

20. A decoupler assembly for transferring torque between an engine driven crankshaft shaft and a drive belt, said decoupler assembly comprising:

a hub configured to be fixedly assembled to the crankshaft;

a spring support fixedly secured to said hub, said spring support having a first tab extending outwardly therefrom;

a carrier rotatably mounted on said hub, said carrier having a second tab extending outwardly therefrom;

a torsion spring extending between a hub end and a carrier end for transferring torque between said spring support and carrier, wherein said hub end includes a first notch engaged with said first tab to prevent relative rotation between said hub end of said torsion spring and said spring support and said carrier end includes a second notch engaged with said second tab to prevent relative rotation between said carrier end of said torsion spring and said carrier.

a pulley rotatably coupled to said hub, said pulley having an outer periphery configured to frictionally engage with the drive belt, said pulley having an inner surface formed therein;

a clutch spring fixedly secured to said carrier and having a plurality of helical coils frictionally engaging with said inner surface of said pulley to selectively couple said hub and pulley, said torsion spring and said clutch spring wound in opposite senses enabling said clutch spring to expand into gripping engagement with said inner surface during acceleration of said hub relative to said pulley and to contract out of gripping engagement with said inner surface during deceleration of said hub relative to said pulley.

21. A decoupler assembly as set forth in claim 20 wherein said hub includes a body extending between first and second ends.

22. A decoupler assembly as set forth in claim 21 wherein said hub includes a reduced diameter portion defining an outer mounting surface having an outer diameter smaller than said body.

23. A decoupler assembly as set forth in claim 22 wherein said hub includes an abutment surface extending between said outer mounting surface and said body.

24. A decoupler assembly as set forth in claim 23 including a flange having a mounting portion configured for fixedly mounting said flange onto said outer mounting surface.

25. A decoupler assembly as set forth in claim 24 wherein said flange includes a U-shaped cross section defined by an end wall extending between inner and outer flange walls.

26. A decoupler assembly as set forth in claim 25 wherein said carrier is retained between said inner and outer flange walls and said end wall, such that said carrier and said clutch spring rotate together with said flange.

27. A decoupler assembly as set forth in claim 26 wherein said pulley includes an inner flange portion having a U-shaped cross section defined by a connecting wall extending between outer and inner pulley walls.

28. A decoupler assembly as set forth in claim 27 wherein said spring support is retained between said outer and inner pulley walls and said connecting wall, such that said spring support rotates with said pulley.

29. A decoupler assembly as set forth in claim 28 including a thrust washer disposed between said mounting portion of said flange and said abutment surface for continuously biasing said first and second tabs of said spring support and carrier toward engagement with said first and second notches of said hub and carrier ends of said torsion spring, respectively.

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